CHLORINE RISK FACT SHEET
Attack Involving Liquefied Chorine Gas Storage Containers

CAMEO (Computer Aided Management of Emergency Operations), an EPA developed suite of software, was used to estimate the health impacts from an instantaneous release of chlorine gas from common sized shipping and storage containers. The resulting plume of toxic gas would move downwind and collect in low lying areas before slowly dissipating. Depending on wind conditions, temperature, land structures and other variables the width of the toxic plume could be expected to range from about 1/8th to 1/4th of its length. If no wind is present, the plume would assume a circular shape as it passively dissipated. Death, permanent injury, and reversible injuries can be projected at the following distances downwind of the release.

Maximum Distance of Impact from Instantaneous Chlorine Release

Amount Released	Lethality	Permanent Injury	Reversible Injury
1 x 150 lb cylinder	0.38 miles	1 mile	1.8 miles
3 x 150 lb cylinders	0.5 miles	1.3 miles	2.3 miles
1 x One ton cylinder	0.85 miles	2.1 miles	3.6 miles
3 x One ton cylinders	1.3 miles	3.1 miles	5.3 miles
1 x 90 ton railcar	6 miles	See footnote	

The model assumes a total and sudden release of liquefied chlorine gas from standardized containers and measures airborne concentration indoors. The model uses inputs based on reasonably expected local conditions. The location is specified as southeast Michigan where unsheltered single level homes average 0.46 air change per hour. The plume is calculated based on 60-minute acute exposure guideline levels (AEGLs) where the concentration is expected to exceed the AEGL threshold for any amount of time during a 60 minute period. Weather conditions are specified as 36º F, wind SW at 2 mph, cloudy and 75% humidity. Statistically, the model is not capable of plume predictions beyond six miles in length with a high degree of confidence, however; estimates of the impacted area can be obtained by extending the footprint based on the first six miles as drawn by the model.

- The White House appointed Homeland Security Council in July, 2004 proposed a number of catastrophic disasters for use by Federal, State, and local emergency preparedness personnel in developing appropriate response capabilities. One scenario dealt with an instantaneous release of chlorine gas at a chlorine storage facility. The report indicated that in a heavily populated area up to 35,000 people could be exposed to lethal concentration of chlorine gas, with about one-half (or 17,500) deaths occurring before or during treatment. An additional 100,000 individuals would be hospitalized. As the modeled area of impact could extend 25 miles downwind of the release it was estimated that some 400,000 "worried" individuals could overwhelm the health care system as they sought medical attention.

- In testimony provided by the US Naval Research Laboratory it was indicated that a terrorist attack against rail cars located in a specific urban area could impact a 50 square mile area and result in 100,000 deaths within 30 minutes.

- In modeling the release of liquefied chlorine gas from a 100 pound cylinder at one of the US National Laboratories. At downwind distances of 2.5 miles individuals were expected to incur serious and irreversible injury. At downwind distances up to 5.6 miles individuals could expect reversible health effects related to mucous membrane irritation.

- In March 2005, in Asia a chlorine-carrying truck was involved in an accident that caused a release. Twenty-nine deaths were reported and 350 people were hospitalized.

Prein&Newhof   CDM   DEQ